

Biomass Feedstock Logistics

Focus: Densification

June 2010

Biomass Logistic Issues:

- Harvest
- Storage
- Transportation



Harvest

- Traditional harvest equipment
 - Round Bales
 - Large Square Balers (3x4, 4x4)
 - Small Square Balers
 - Field Choppers
- Specialized harvest equipment
 - Field pelletizers and cubers, other custom field processing equipment

Storage

- Traditional Storage



Issues:

- Weather, space limitations, UV damage, fire, etc.

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Transportation



Transportation

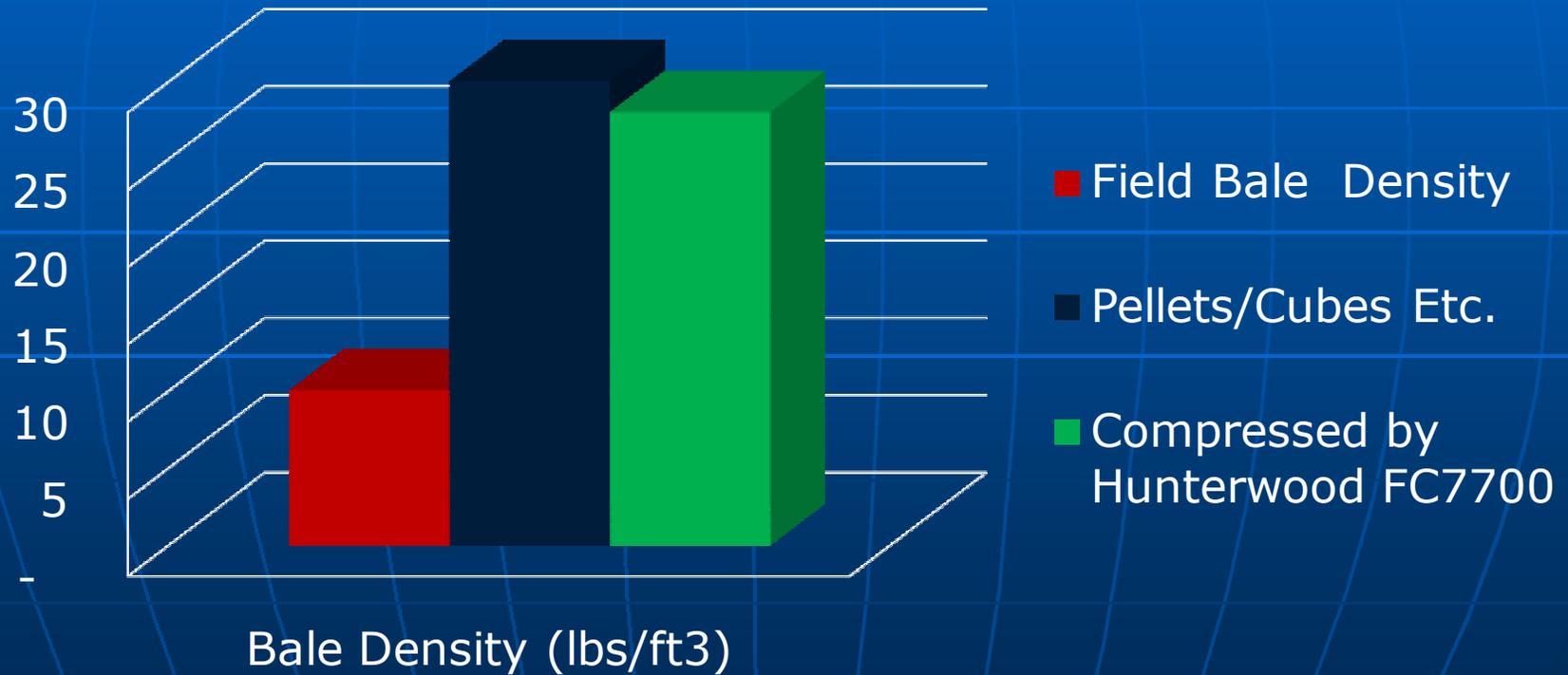
- By truck/trailer is most common
- Trucking costs are consider to be the highest in biomass logistics
- Low field density of product results in poor utilization of transport capacities.
- Existing bale formats can be difficult to load and safely secure

Densification as a solution

- Why densify?
 1. Maximize transport
 2. Maximize storage

Why select double compression for Biomass?

Bale Density



Production Rates	Pellets / Cubes	HWD FC7700
Hourly (Metric Tonnes Per Hour)	8 - 10 Ton/hr	40 MT/hr +
Annually (Metric Tonnes)*	42,500	170,000
* Based on 2 x 10 hour shifts, 5 days per week, 50 weeks per year, 85% uptime		

Harvest

- Hunterwood has products that can accept:
 - 2-tie bales, 3-tie bales, 3x3 square bales, 3x4 square bales, 4x4 square bales, round bales, loose product (round bales need to be unrolled or shredded)
- No specialized equipment is required in the harvest of products

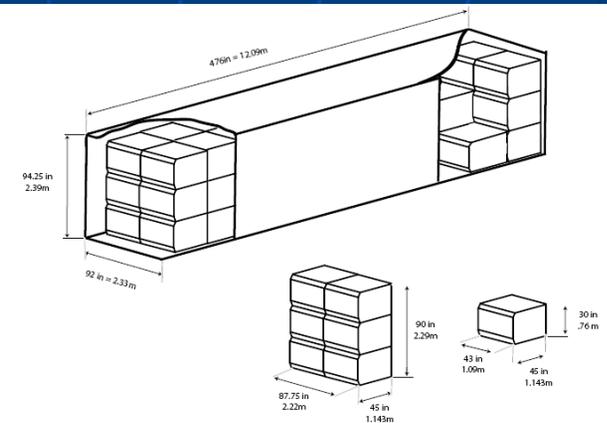
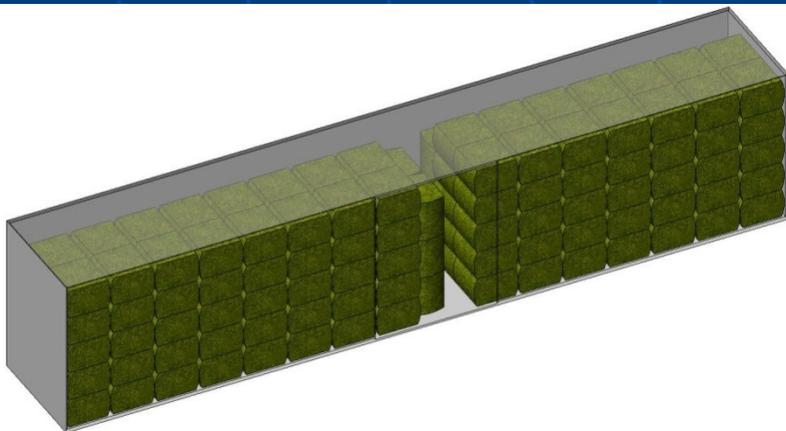
Compressed Hay Storage

- Packages are easily stacked
- Density of product and packaging materials assist in repelling new moisture



Transportation of Compressed Hay

- Maximum densities achieved = more product per load
- Optimize truck, train, and shipping container transport methods
- Dense packages allow for load to be easily secured



Other reasons to use compression

- Customizable fiber length during processing
- Possibly reduces decomposition due to density and available oxygen
- Infrastructure and extra capacity exists in the forage export industry
- Proven and reliable technology
- High processing volumes

How can Hunterwood Technologies Help

- Maximize transportation with maximum weight containers
- Maximum output possible in shortest period of time
- Automation of facilities and product handling to limit staffing and equipment requirements
- Utilize reliable efficient equipment and technology to manage these issues
- Ensure the most efficient processing by close management of down time and total daily/hourly output

Background:

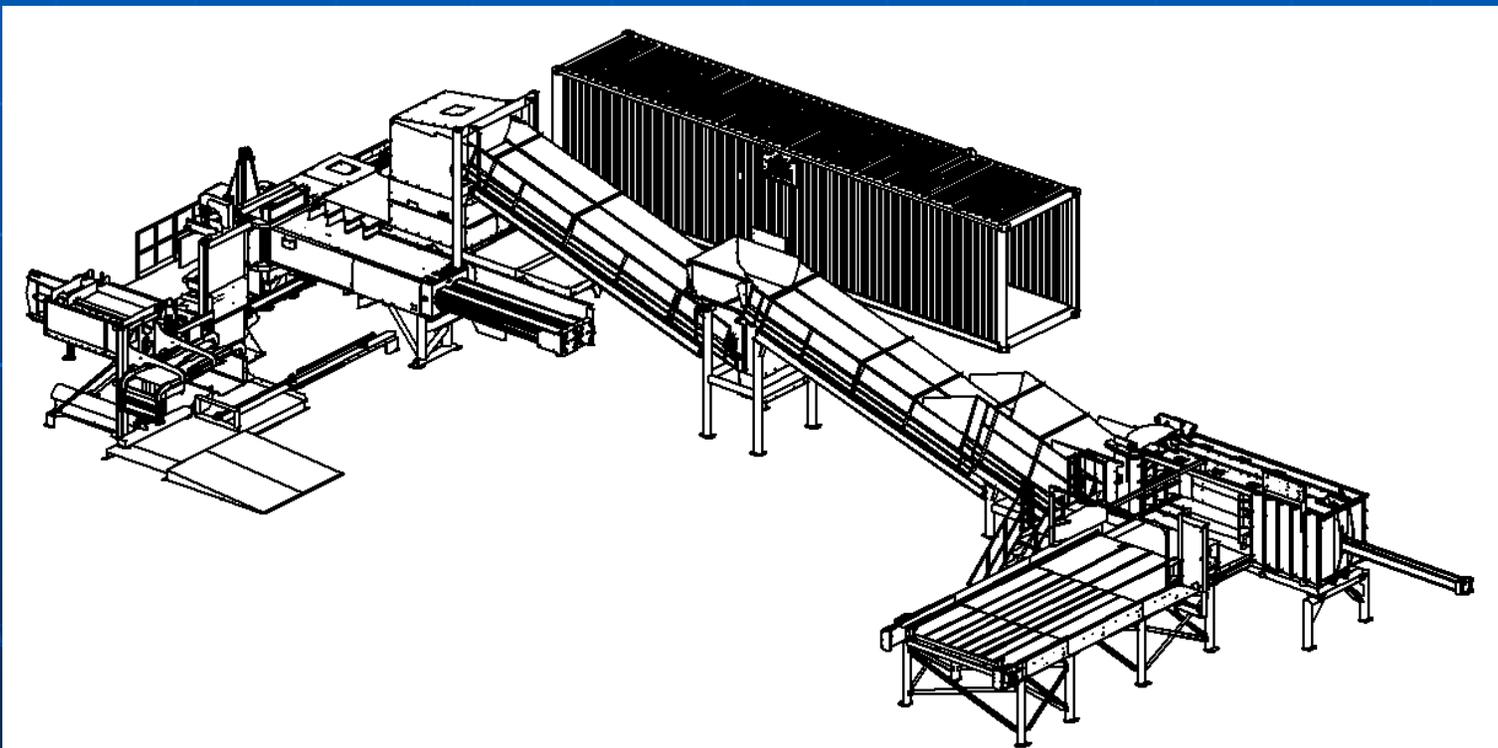
- Located in Cochrane, Alberta, Canada.
- Officially formed in 1994.
- Rick Littlewood principle owner.
- Dedicated to the Forage Export Industry.
- Designed & Built 57 Forage Presses.
- Installed in Canada, USA, Australia and Northern Europe.



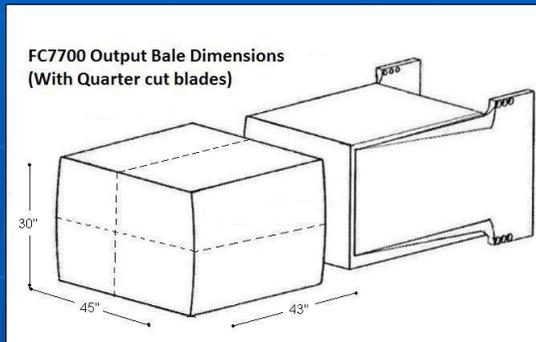
Hunterwood Design Philosophy:

- Engineered Approach
- Simplistic and Modular Design
- High Quality Components and Materials
- Industrial versus Agricultural based Equipment
- Powerful, efficient, fast
- World Leader: Pioneering & Innovation for Hay Export Industry

HUNTERWOOD TECHNOLOGIES FC7700 FORAGE COMPACTOR

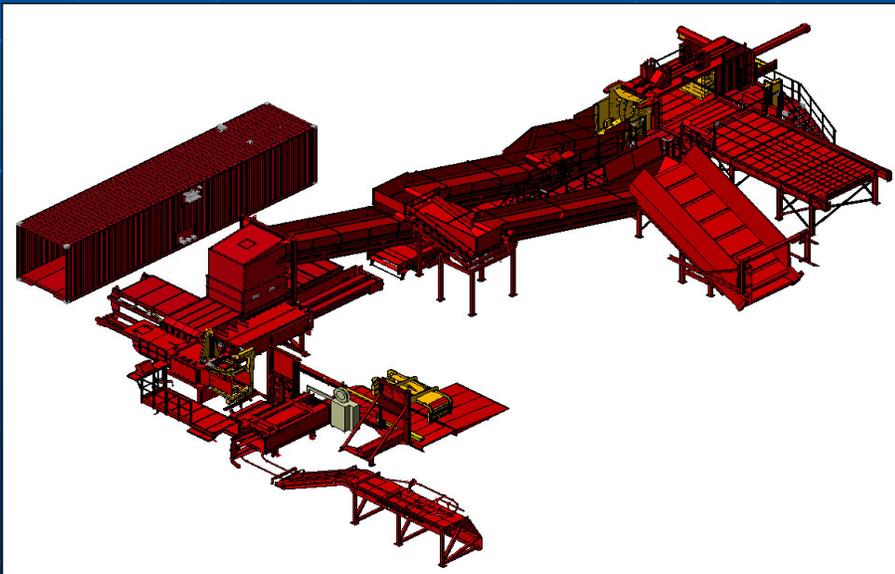


FC7700 Loose Product Big Bale Press



Features of the FC7700

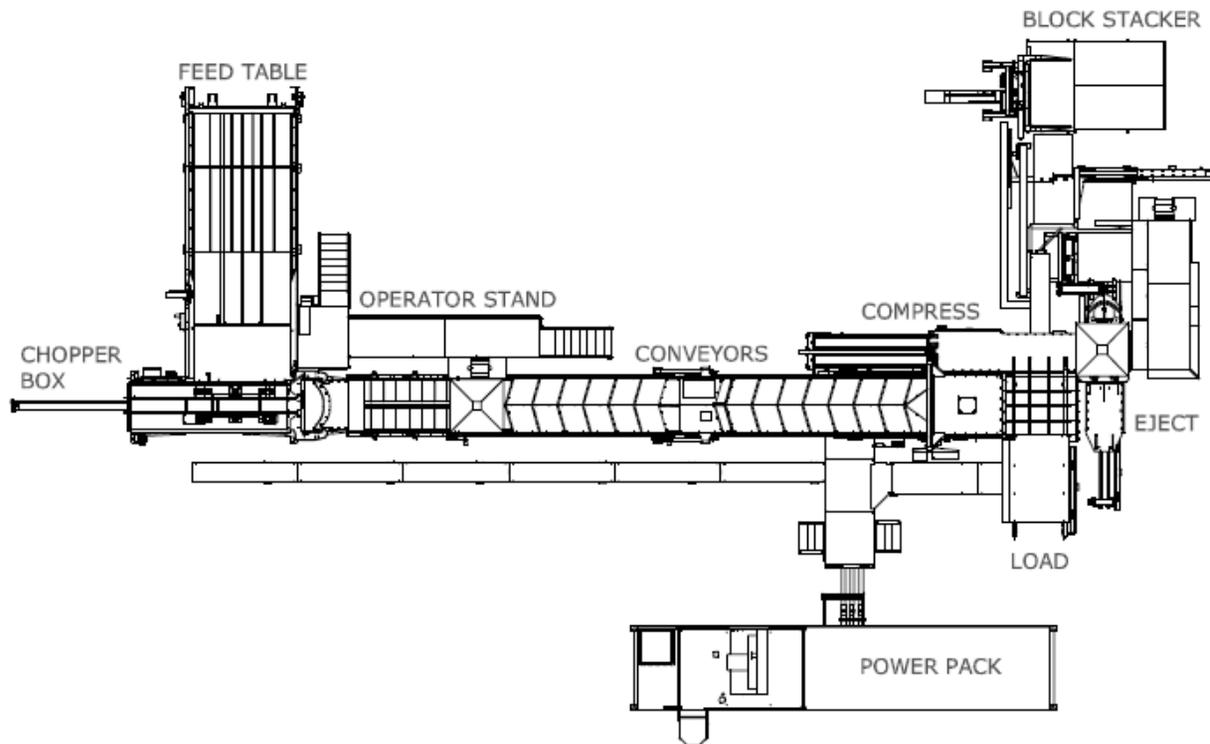
- High-Speed Press
- Automated Operation
- Accepts multiple types of inputs
- Capable of densifying most biomass products
- Customizable fibre length
- FC7700 is Third Generation
- Proven and Reliable
- Dependable Run-time
- Efficiency
- 450 Kg bales



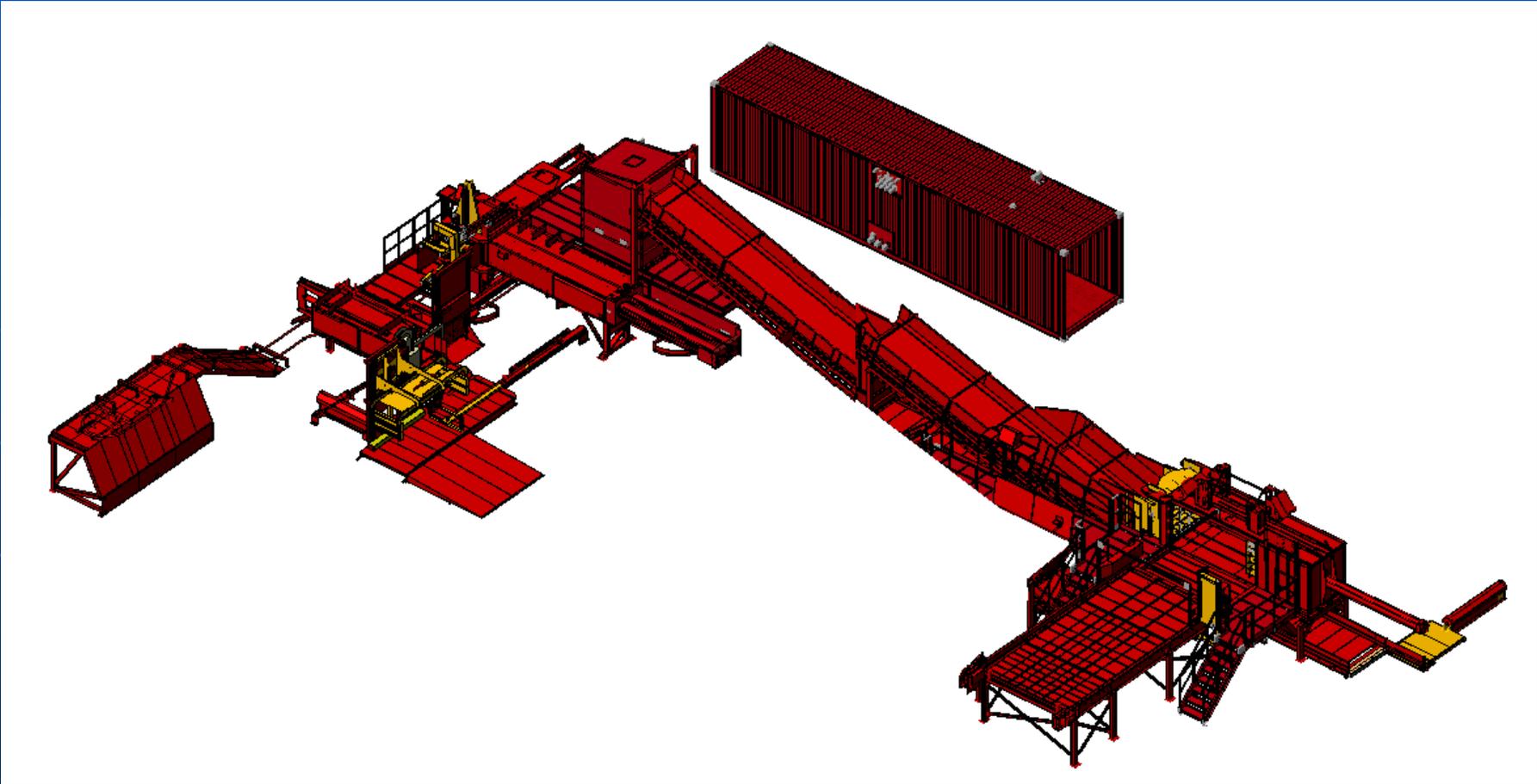
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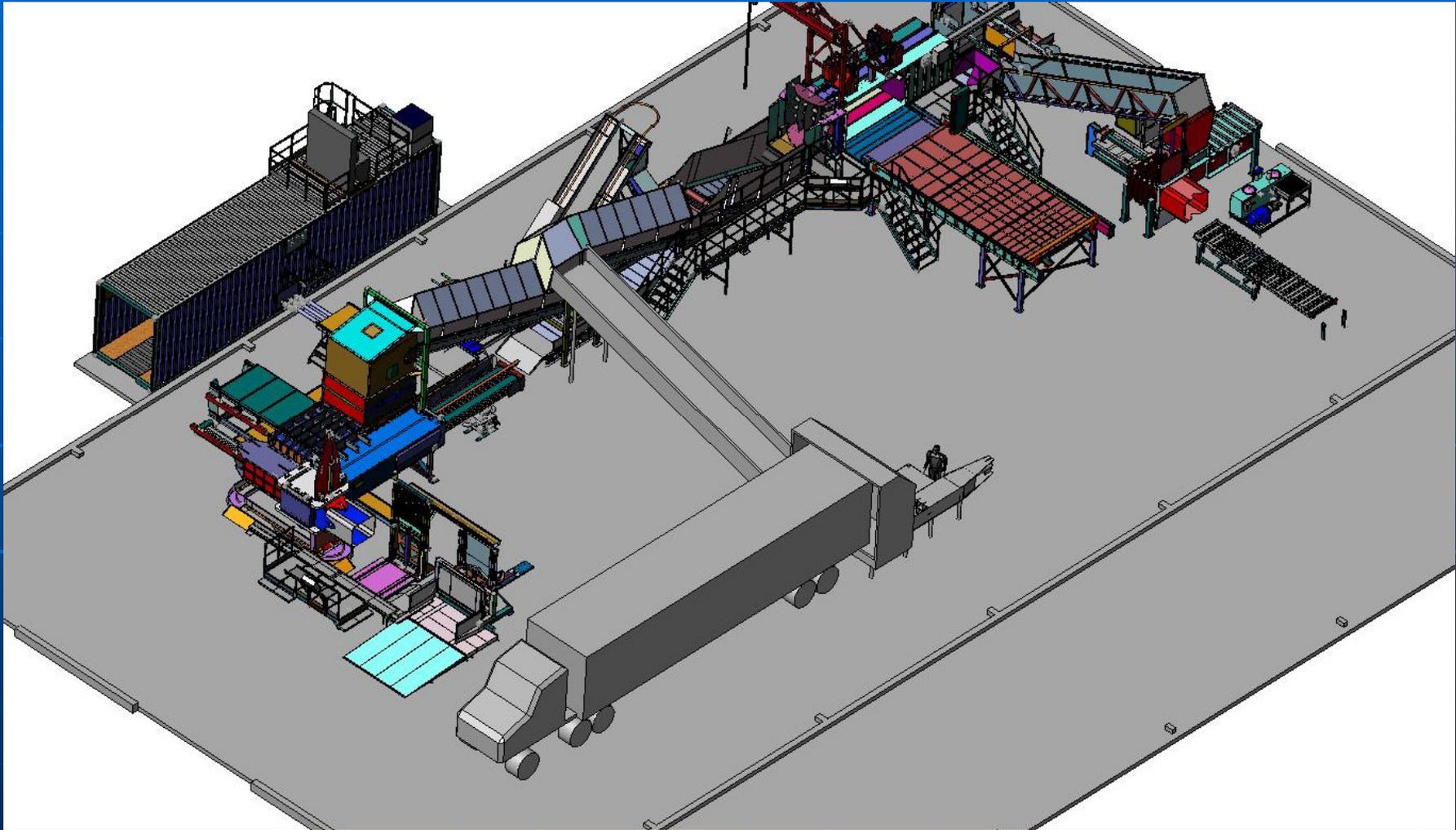
FC7700 BIG BALE PRESS



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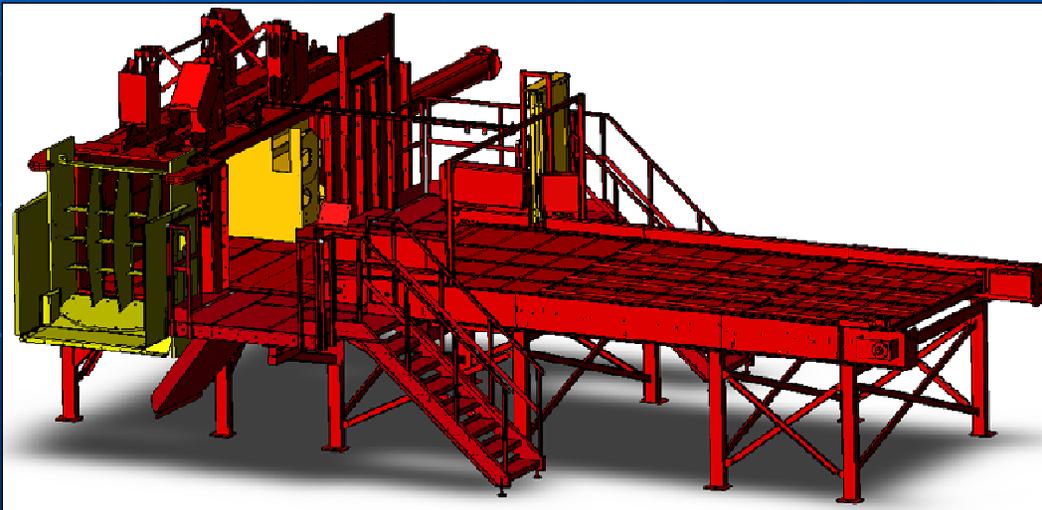


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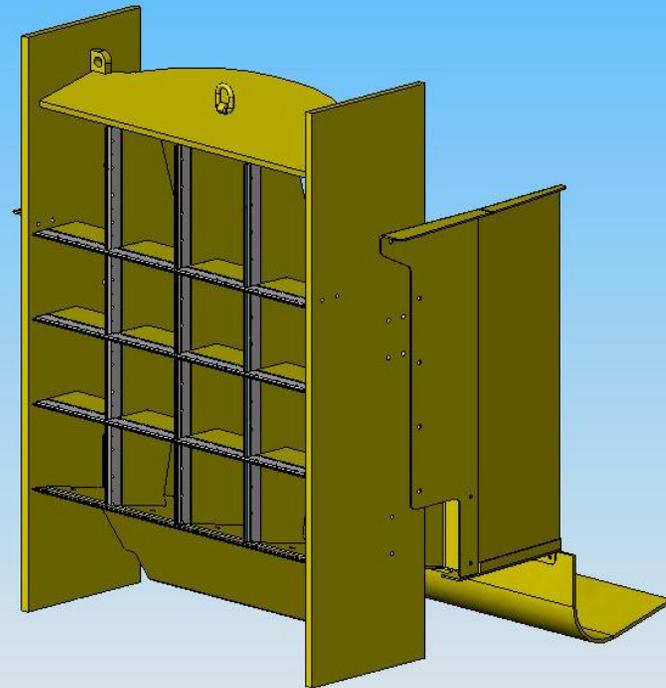
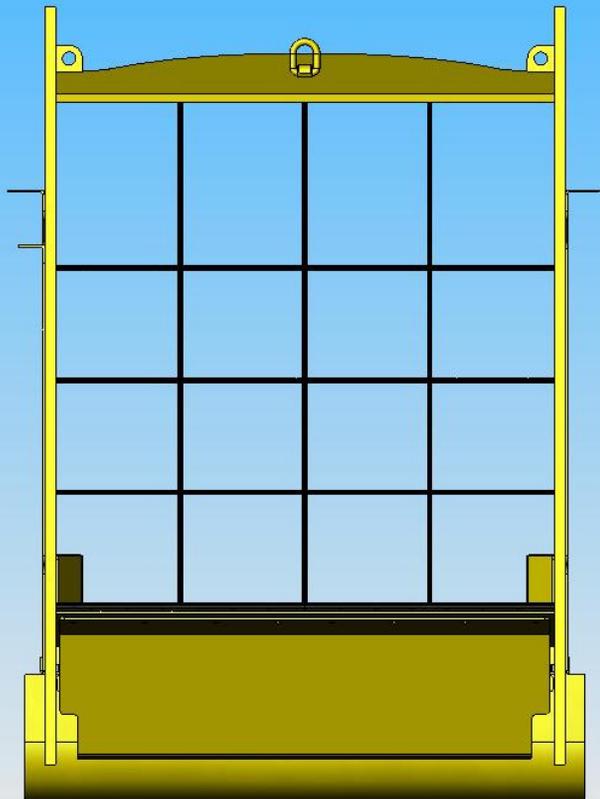
FC7700 Loose Product Big Bale Press

Keys to Quality: Grid Slicing System



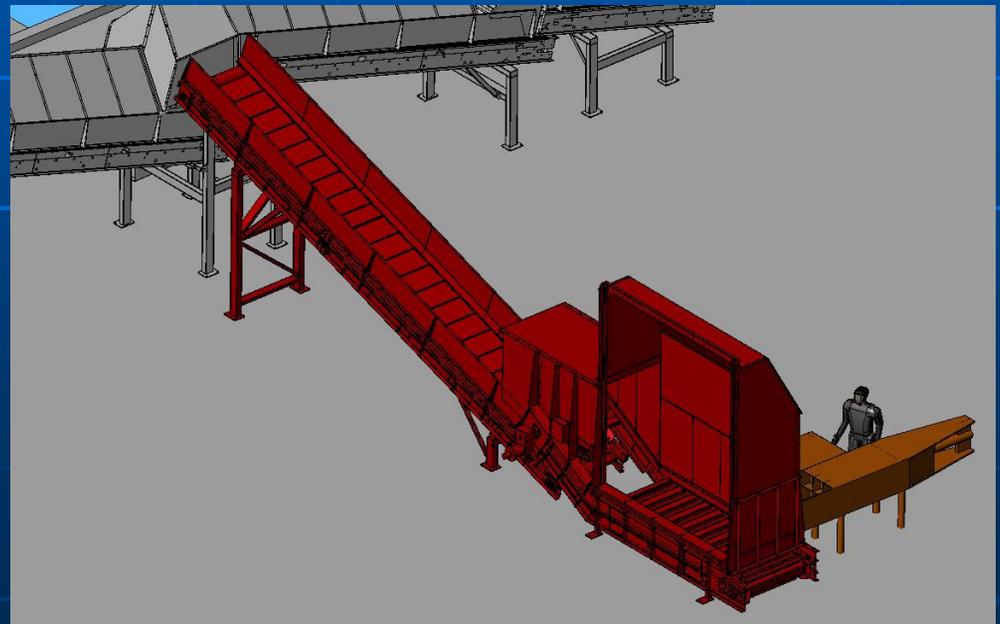
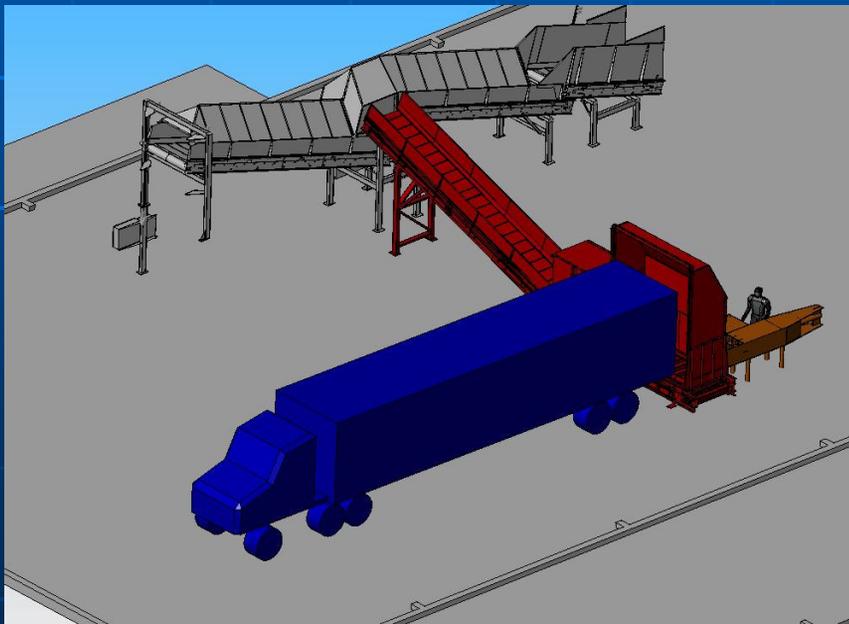
- Big Bale Processing
 - 3' x 4' x 8'
 - 4' x 4' x 8'
- Promotes Leaf Retention
- Bad Bottom Reject
- Grid slicing allows for custom fiber length

Grid Slicing

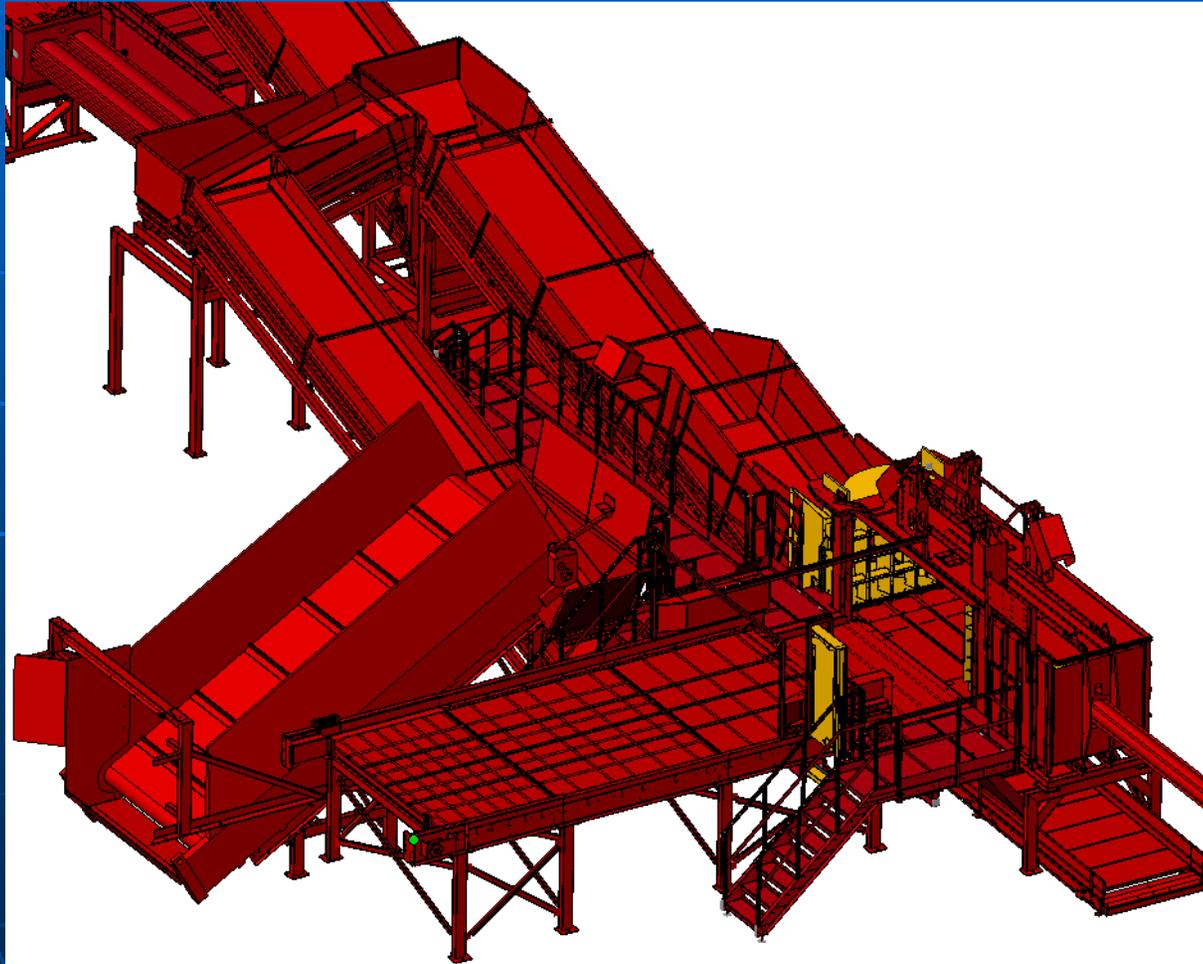


Multiple In-feed Systems

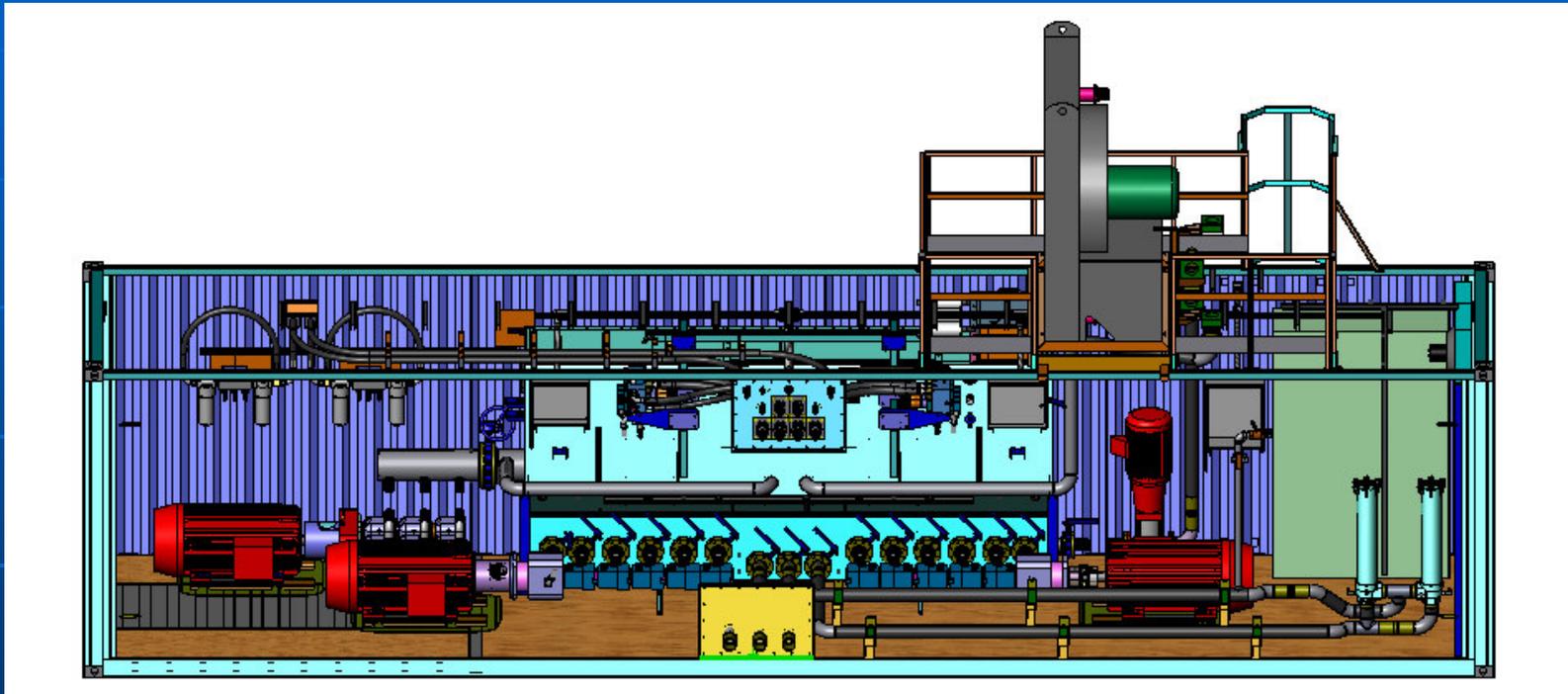
- Product from walking floor trucks or similar can be easily introduced into the product flow
- Nearly all biomass product can be densified



FC7700 Blending Conveyors



Keys to Speed and Efficiency: Hydraulics & Programming



- Pre-wired, Self-Contained Power Pack
- High Flow Manifolds
- 2011 Operating System
- Synchronization of Devices
- Hunterwood Support

FC7700 Loose Product Big Bale Press

Factors of Lost Production

- Employee stoppages
- Input supply problems and production schedule coordination
- Employee skill, knowledge and motivation
- Plant and facility issues, procedures and expectations
- Machine breakdowns and maintenance

Loss Prevention

- Proactive and preventative maintenance routines
- Proficient operators and trained production personnel
- Hunterwood “*Online*” reporting system
- Spare Parts Inventory

FC7700 Loose Product Big Bale Press



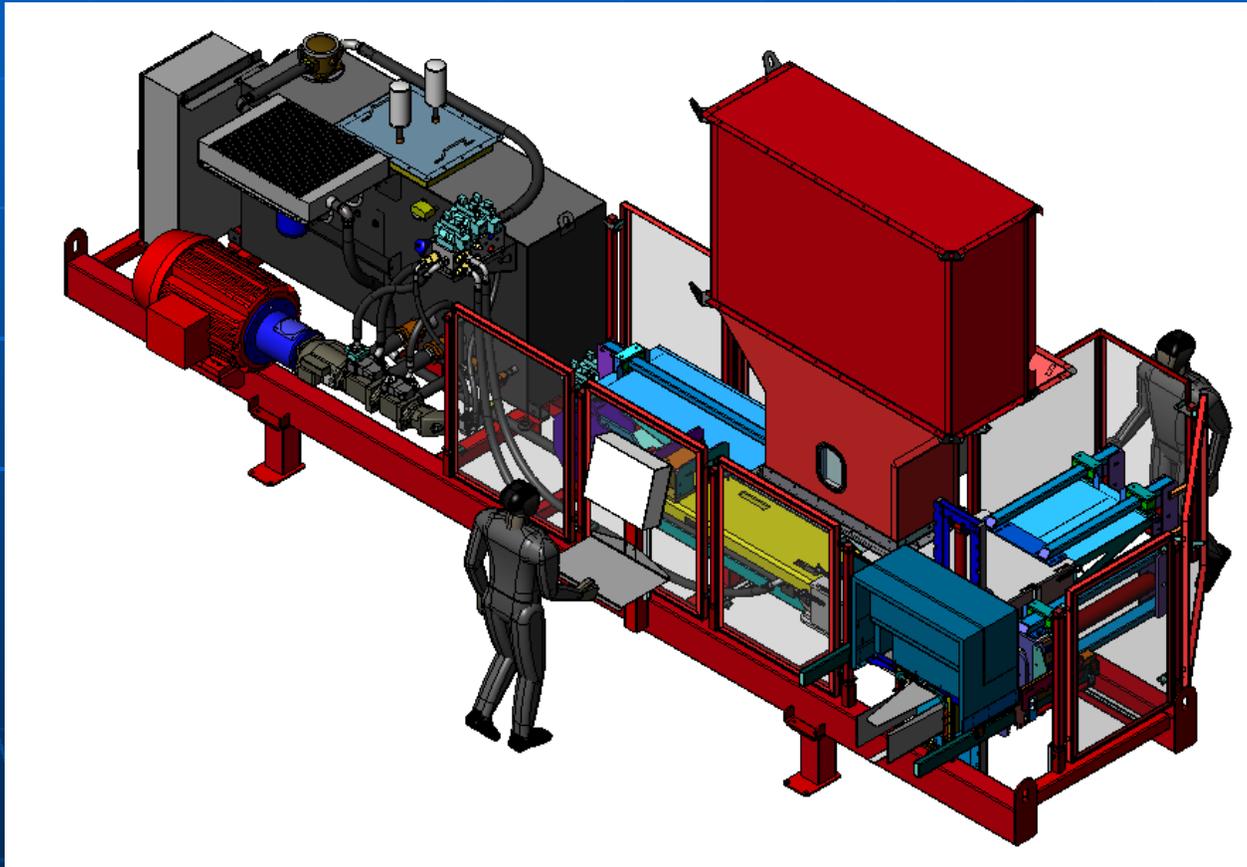
FC7700 Equipment Specifications

- **Power Supply Requirement** 1000 Amp - 480 volt 3 phase 60 hertz *(or local equivalent)*
- **Hydraulic Oil Requirement**
 - Tank Capacity 2000 US Gallons
 - In System Capacity 400 US Gallons
 - Total Capacity 2400 US Gallons
- **Input Forage Bale Types** 3x4x8 or 4x4x8, loose, 3-tie, 2-tie (Pending optional equipment)
- **Output Bale Size Approximate** 30 High x 43 Long x 45 Wide (inches)
- **Main Compression Cylinder** Twin 12 inch
- **Hydraulic System Pressure** 5500 PSI MAX
- **Oil Cooling System** Oil to Air Exchanger @ 264 GPM
- **Total HP**
 - Main Motor 1 250 HP
 - Main Motor 2 250 HP
 - Auxiliary Motor 200 HP
 - Cooling Fan Motor 20 HP
 - Cooling Pump Motor 15 HP
- **Compress Total force** 600 Tons (Peak fiber stress of over 1500 PSI)
- **Design Bale Weight** 450 KG -990lbs*
- **Rated Tonnage** 40 MT tons/ Hr**
- **Approximate Retail Cost: \$1.2 Million – \$2.3 Million depending on feed options and production requirements.**

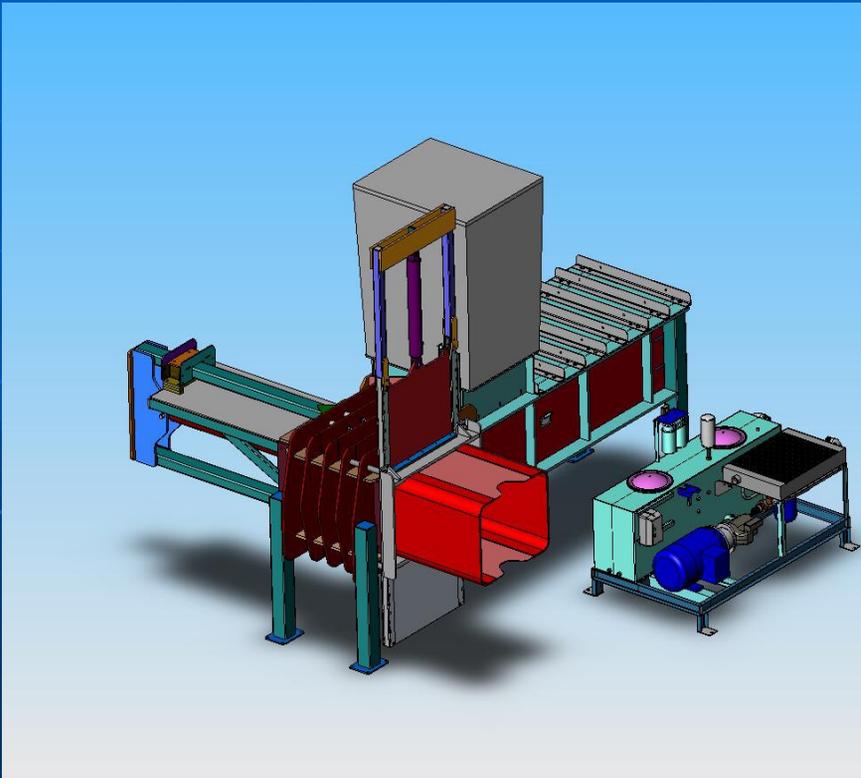
***/** Bale weighs and tonnage are based on quality alfalfa forage. Bales weights and processing speeds may be impacted by forage type/quality, moisture content, operators experience, product output configurations, and other variables.**

Other Hunterwood Products

Micro Bale Chaff / Blending Press



Mid-Density Loose Product Press



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